Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at http://about.jstor.org/participate-jstor/individuals/early-journal-content.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

$$1-\cos(a\,\pi)=\frac{4a\sin(a\,\pi)}{\pi}\left[\frac{1}{1^2-a^2}+\frac{1}{3^2-a^2}+\frac{1}{5^2-a^2}+\ldots.\right], \tag{5}$$

whence the value of the series, (1), when $0<a>1$, is readily found to be $\frac{\pi}{a}\tan\left(\frac{\pi a}{2}\right)$, as required by the problem.

When $a>1$, or $a<-1$, let $b=a^{-1}$, and substitute in the problem. The definite integral does not change its form by making this substitution, but the right hand member of the equation does change. Hence the given equation does not hold for values of $a>1$, or <-1. It can readily be shown that the equation holds when $a=0$, $a=\pm 1$, and when $0>a>-1$. The range of values of a in which the given equation holds is, then, $-1\leqq a\leqq 1$.

Also solved by C. N. Schmall, V. M. Spunar, J. Scheffer, and the Proposer.

270. Proposed by S. A. COREY, Hiteman, Iowa.

Prove that $\sum_{x=0}^{x=\infty}\frac{1}{(a^2+x^2)^n}=\frac{\pi}{2a^{2n-1}}\cdot\frac{1}{2}\cdot\frac{3}{4}\cdot\frac{5}{6}\cdot\ldots\frac{(2n-3)}{(2n-2)}\cdot\frac{1}{2a^{2n}}$, n being a positive integer >1.

Solution by G. B. M. ZERR, A. M., Ph. D., Philadelphia, Pa.; C. N. SCHMALL, New York City; and J. SCHEFFER, A. M., Hagerstown, Md.

Assuming $\sum_{x=0}^{x=\infty}\frac{1}{(a^2+x^2)^n}\equiv\int_0^\infty\frac{dx}{(a^2+x^2)^n}$, the integral may be evaluated in two different ways.

(1) Assume the equation

$$\int_0^\infty\frac{dx}{x^2+a}=\frac{\pi}{2}\cdot\frac{1}{a^{\frac{1}{2}}}.$$

Now differentiate both sides $(n-1)$ times with regard to a, we obtain

$$\int_0^\infty\frac{dx}{(x^2+a)^n}=\frac{\pi}{2}\,\frac{1.3.5\ldots(2n-3)}{2.4.6\ldots(2n-2)}\,\frac{1}{a^{n-\frac{1}{2}}};$$

and substituting a^2 for a, we have

$$\int_0^\infty\frac{dx}{(a^2+x^2)^n}=\frac{\pi}{2}\cdot\frac{1.3.5\ldots(2n-3)}{2.4.6\ldots(2n-2)}\cdot\frac{1}{a^{2n-1}}.$$

SCHMALL.

(2) Or, by putting $x=a\tan\theta$ in the given integral, we have

$$\int_0^\infty\frac{dx}{(a^2+x^2)^n}=\frac{1}{a^{2n-1}}\int_0^{\frac{1}{2}\pi}(\sin\theta)^{2n-2}d\theta=\frac{1}{a^{2n-1}}\cdot\frac{1.3.5\ldots(2n-3)}{2.4.6\ldots(2n-2)}\cdot\frac{\pi}{2}.$$

SCHMALL, ZERR, SCHEFFER.